Carnegie Institution of Washington

Scope and Organization

Founded by Andrew Carnegie

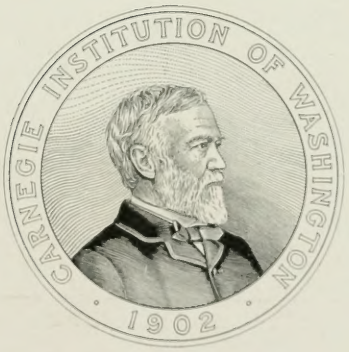
Tenth Anniversary

THE ADMINISTRATION BUILDING OF THE CARNEGIE INSTITUTION OF WASHINGTON, 1911

The Carnegie Institution of Washington

Founded by Andrew Carnegie

Scope and Organization



Issued on the Occasion of the Tenth Anniversary
December 14, 1911

PRESENT ORGANIZATION OF THE INSTITUTION.

ROBERT S. WOODWARD, *President.*

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*Member ex-officio of Executive Committee.

LIST OF PRESENT AND FORMER TRUSTEES.

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John L. Cadwalader,	1903–	Andrew J. Montague,	1907–
Cleveland H. Dodge,	1903–	William W. Morrow,	1902–
*William E. Dodge,	1902–03	Wm. Barclay Parsons,	1907–
Simon Flexner,	1910–	Henry S. Pritchett,	1906–
William N. Frew,	1902–	Elihu Root,	1902–
Lyman J. Gage,	1902–	Martin A. Ryerson,	1908–
*Daniel C. Gilman,	1902–08	John C. Spooner,	1902–07
*John Hay,	1902–05	William H. Taft,	1906–
*Abram S. Hewitt,	1902–03	Charles D. Walcott,	1902–
Henry L. Higginson,	1902–	Henry P. Walcott,	1910–
*Ethan A. Hitchcock,	1902–09	William H. Welch,	1906–
*Henry Hitchcock,	1902–	Andrew D. White,	1902–
*William Wirt Howe,	1903–09	Edward D. White,	1902–03
Charles L. Hutchinson,	1902–	George W. Wickersham,	1909–
*Samuel P. Langley,	1904–06	Robert S. Woodward,	1905–
*William Lindsay,	1902–09	*Carroll D. Wright,	1902–08
Seth Low,	1902–		

*Deceased.

Besides the names enumerated above, the following were ex-officio members of the Board of Trustees under the original charter, from the date of organization until April 28, 1904:

The President of the United States.

The President of the Senate.

The Speaker of the House of Representatives.

The Secretary of the Smithsonian Institution.

The President of the National Academy of Sciences.

PLAN AND SCOPE OF THE INSTITUTION.

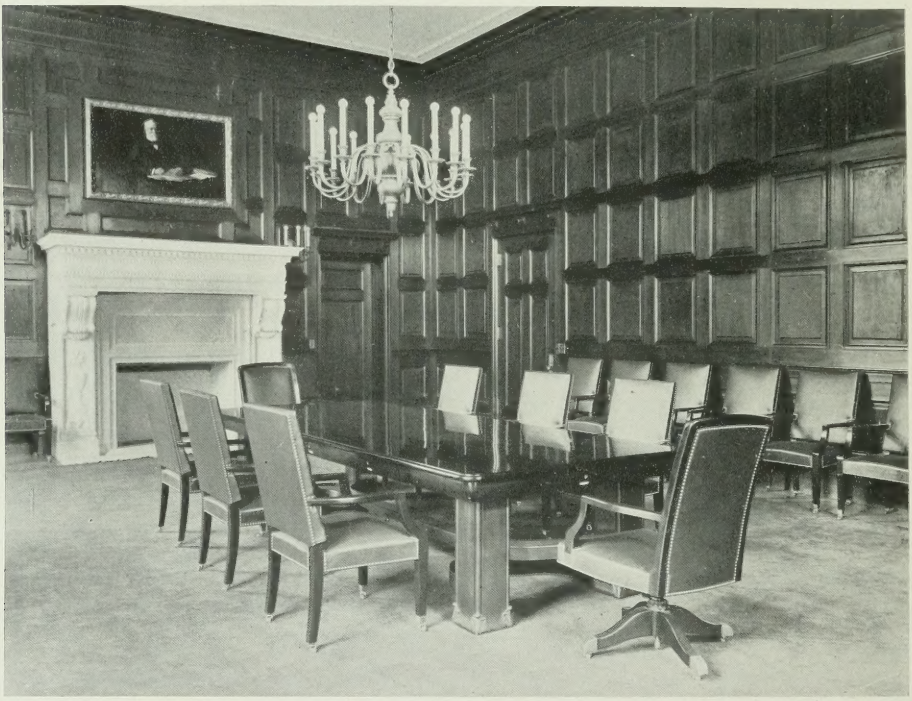
The Carnegie Institution of Washington was founded by Mr. Andrew Carnegie January 28, 1902, when he gave to a board of trustees an endowment of registered bonds of the par value of ten million dollars. To this fund an addition of two million dollars was made by Mr. Carnegie on December 10, 1907, and a further addition of ten million dollars was made by him January 19, 1911; so that the present endowment of the Institution has a par value of twenty-two million dollars, yielding an annual interest of five per cent on this amount. The Institution was originally organized under the laws of the District of Columbia and incorporated as the Carnegie Institution, but was reincorporated by an act of the Congress of the United States, approved April 28, 1904, under the title of the Carnegie Institution of Washington.

Organization under the new Articles of Incorporation was effected May 18, 1904, and the Institution was placed under the control of a board of twenty-four trustees, all of whom had been members of the original corporation. The Trustees meet annually in December to consider the affairs of the Institution in general, the progress of work already undertaken, the initiation of new projects, and to make the necessary appropriations for the ensuing year. During the intervals between the meetings of the Trustees the affairs of the Institution are conducted by an Executive Committee chosen by and from the Board of Trustees and acting through the President of the Institution as chief executive officer.

The Articles of Incorporation of the Institution declare in general "that the objects of the corporation shall be to encourage in the broadest and most liberal manner investigation, research, and discovery, and the application of knowledge to the improvement of mankind." Three principal agencies to forward these objects have been developed. The first of these involves the formation of departments of research within the Institution itself, to attack larger problems requiring the collaboration of several investigators, special equipment, and continuous effort. The second provides means whereby individuals may undertake and carry to completion investigations not less important but requiring less collaboration and less special equipment. The third agency,

namely, a division devoted to editing and printing books, aims to provide adequate publication of the results of research coming from the first two agencies and to a limited extent also for worthy works not likely to be published under other auspices.

Summarily, the work of the Institution may be classified under the heads of a Division of Administration, a Division of Publications, Departments of Research, and a Division of Research Associates. The Division of Administration consists of nine persons and is charged with the executive, financial and correspondence



Board Room in Administration Building.

duties of the Institution. The Division of Publications consists of three members permanently employed, and has charge of the work of editing and printing books, as stated above. Temporary assistance in connection with illustrations, proof-reading, etc., is also employed by this division as needed. The staffs of these two divisions are given on page 8. Ten of the larger departments of research have thus far been established by the Institution. The designations of these departments, the names and addresses of their Directors, the investigatory staffs, and brief indications of their origin, development, and present status, are given in the following

pages. Many grants have been made in aid of minor projects for investigation, and many Research Associates and collaborators, connected mostly with colleges and universities, have been and are carrying on work also under the auspices of the Institution.

A View of the Rotunda, Administration Building.

A condensed history of the origin, development, and growth of the Institution will be found in the President's Report contained in the Year Book for 1911, which also gives lists of all persons

who have been engaged in the work of the Institution from the time of its organization. A more comprehensive view of this history may be gained from the contents of the Year Books and other more formal publications issued during the past ten years. General and classified lists of these publications may be had on application to the Institution, and the publications themselves may be found in nearly all of the greater libraries of the world. About two hundred individual volumes have been issued up to date. A list of these books, giving their full titles, together with an index of authors, will be found as an appendix to the tenth Year Book of the Institution.

The executive office of the Institution is in its Administration Building on the southeast corner of Sixteenth and P streets, northwest, Washington, D. C. This building is constructed of Bedford limestone, is three stories in height and has an available floor space of about 21,000 square feet. The basement is devoted chiefly to file rooms and to rooms for the receipt, shipment, and storage of the publications of the Institution, with fireproof vaults and shelving provided for the publications. The second floor is supplied with board and committee rooms for the use of the Trustees and the Executive Committee, and with an Assembly Room having a seating capacity for about two hundred persons. The third floor has twelve rooms, furnishing adequate quarters for the Division of Administration and the Division of Publications.

DIVISION OF ADMINISTRATION.

ROBERT S. WOODWARD, *President.*

OFFICE STAFF.

WALTER M. GILBERT, Assistant Secretary.
CLARENCE REEDER, President's Secretary.
JOHN L. WIRT, Bursar.
EDMUND A. VARELA, Assistant Bursar.
CLAUDE F. KING, Custodian of Files.
HENRIETTA R. JOHNSON, Stenographer.
IRVING M. GREY, Shipping Clerk.
CHARLOTTE S. STEVENS, Clerk.
EDWARD B. FRISTOE, Clerk.

DIVISION OF PUBLICATIONS.

WILLIAM BARNUM, Editor.
FLORENCE F. STILES, Proof-reader.
CHARLES J. STODDARD, Stenographer.

DEPARTMENT OF BOTANICAL RESEARCH.

Director, Dr. D. T. MacDougal.
Address, Desert Laboratory, Tucson, Arizona.

PRESENT INVESTIGATORY STAFF.

William A. Cannon.
Forrest Shreve.
H. A. Spoehr.
G. Sykes.

This Department was formally established December 12, 1905. Three years previously, however, the Board of Trustees of the Institution authorized the construction of a laboratory at Tucson, Arizona, for the special needs of botanical research in desert areas. This laboratory was completed during the year 1903, in accordance with plans drawn up by Mr. F. V. Coville and Dr. D. T. MacDougal, who served as an advisory committee on the conduct of work at the laboratory until the present organization was effected.

The Department has the following equipment in buildings:

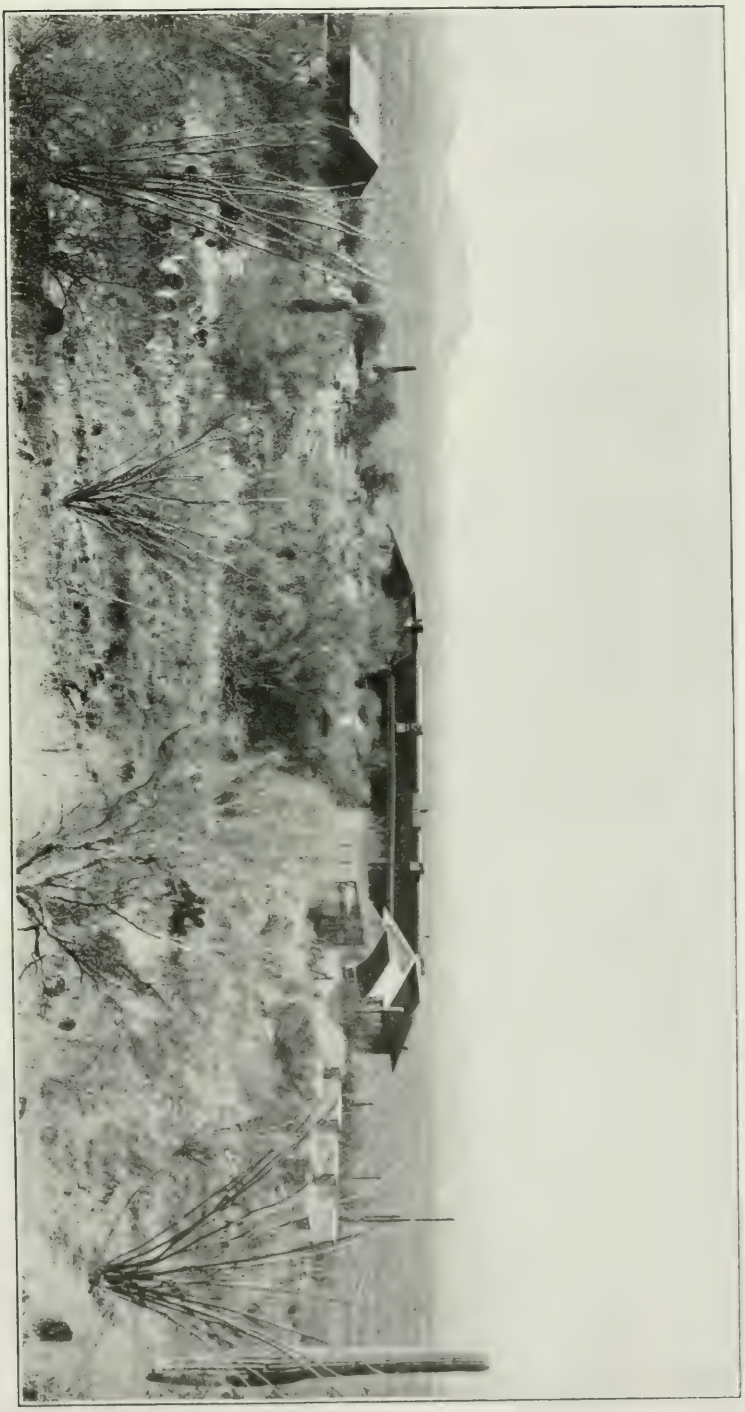
At Tucson, Arizona: (1) Main laboratory, of stone; (2) Shops, of stone; (3) Office and laboratory of adobe and brick on experimental grounds in valley of Santa Cruz River; (4) Three water reservoirs, of stone.
At Carmel-by-the-Sea, California: (5) Frame laboratory.

The last-named building is a gift to the Department from the Carmel Development Company. The situation of Carmel on the Pacific Coast is especially useful for the extension of the investigations of the Department upon the reactions of organisms to environmental agencies. The main laboratory at Tucson is located in a land reservation of about 863 acres, bearing characteristic desert vegetation. In addition, the Department has reservations for plantations in the Santa Catalina Mountains of Arizona and stations for experimentation at various points in the desert areas of the Southwestern states. The altitudes of these reservations and stations range from below sea-level at Salton Sea, California, to 8,000 feet in the Santa Catalina Mountains, Arizona.

The chief researches of the Department have been concerned with a group of problems connected with the phyto-chemistry, water-relations, and environic reactions of plants. Contributions have been made to the subjects of dissemination and distribution of desert plants, origination and fate of plant populations, root-

habits of plants in desert regions, soil moisture and evaporation, evaporation as a limiting factor in determining the general character of the vegetation of a region, the mechanics of stomatal action and transpiration, the water-balance of plants in desert regions, diurnal and seasonal variations in the composition of the sap, the origination of parasites, and variations in heredity induced by ovarial treatments with various substances. Some results have also been published as to the reactions of organisms when taken from one type of climate to another, such as are obtained by transplantations from mountain summits to the seashore or from humid to arid localities. Studies of fluctuations in intensity of climatic factors in recent geologic time are now under way, and special attention has been given to the phenomena of aridity in desert basins occupied by intermittent or fluctuating lakes, in which interest has been centered on the Salton Lake, formed in 1905 and now receding at a rate of 50 inches yearly. Travertine formation, the initial changes in woods in fossilization, the accommodation of organisms to concentrating brines, the changes in lacustrine deposits incident to aridity, and the mechanics of re-vegetation of emersed areas are special subjects to which contribution may be made.

Acclimatization Shelter, Tumamoc Hill, Arizona.



Main Building, Desert Laboratory, Tucson, Arizona.

DEPARTMENT OF ECONOMICS AND SOCIOLOGY.

Chairman, PROFESSOR HENRY W. FARNAM.
Address, 43 Hillhouse Avenue, New Haven, Connecticut.

The work of this department is at present conducted by twelve collaborators each in charge of a division as follows:

Population and Immigration, Professor Walter F. Willcox, Cornell University.

Agriculture and Forestry, President Kenyon L. Butterfield, Massachusetts Agricultural College.

Mining, Mr. Edward W. Parker, United States Geological Survey.

Manufactures, Dr. Victor S. Clark, in charge of the United States Census in Hawaii.

Transportation, Professor B. H. Meyer, University of Wisconsin, now member of the Interstate Commerce Commission.

Domestic and Foreign Commerce, Professor Emory R. Johnson, University of Pennsylvania.

Money and Banking, Professor Davis R. Dewey, Massachusetts Institute of Technology.

The Labor Movement, Professor John R. Commons, of the Wisconsin Industrial Commission.

Industrial Organization, Professor J. W. Jenks, Cornell University.

Social Legislation, Professor Henry W. Farnam, Yale University.

Federal and State Finance, including Taxation, Professor Henry B. Gardner, Brown University.

The Negro in Slavery and Freedom, Alfred Holt Stone, Dunleith, Mississippi.

This Department is at present engaged in the preparation of contributions to an economic history of the United States. This plan was adopted on the recommendation of an advisory committee consisting of the Honorable Carroll D. Wright, Professor J. B. Clark, and Professor Henry W. Farnam, whose report is printed in the Year Book for 1902. In 1903 Dr. Wright was appointed director and the Department was organized. From the outset, the project received the endorsement of the American Economic Association and of the American Historical Association, and it has been carried on with their cooperation as well as with the

help of professors and students of economics and history in many universities.

As an aid to the collaborators, provision was made in December 1906 for the compilation and publication of an index of the economic materials in the public documents of the states of the United States. This work has been carried on under the auspices of the Department by Miss Adelaide R. Hasse, of the New York Public Library, and volumes for the states of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, New York, California, Illinois, Kentucky, and Delaware have been published.

Thus far the studies have been of a preliminary nature. In addition to the Index of State Documents, of which 10 volumes have been published, and one is in press, over 150 monographs and books have been prepared. Of these, about one-third have been published in whole or in part. The Documentary History of American Industrial Society, edited by Prof. John R. Commons and a group of scholars under the immediate direction of the Bureau of Industrial Research, aided by a grant of money from the Carnegie Institution, also forms part of the material of this department. A bibliography of these works, both published and unpublished, may be had upon application. Over 200 scholars have cooperated in the work of this department. Several of the collaborators are now engaged in preparing their final volumes or reports, based upon these preliminary studies.

After the death of Dr. Wright, on February 20, 1909, Professor Henry W. Farnam, who had hitherto acted as secretary of the board of collaborators, was appointed chairman of this board, and as such he has since had general charge of the affairs of the Department.

DEPARTMENT OF EXPERIMENTAL EVOLUTION.

Director, PROFESSOR CHARLES B. DAVENPORT.
Address, Cold Spring Harbor, Long Island, N. Y.

PRESENT INVESTIGATORY STAFF.

ARTHUR M. BANTA. J. ARTHUR HARRIS.
HUBERT D. GOODALE. GEORGE H. SHULL.
R. A. GORTNER.

After the subject of research in biology had been under consideration for nearly two years, a plan for the establishment and maintenance of a station for experimental evolution was approved in December 1903. This plan was submitted to the Institution by Professor Charles B. Davenport in May 1902.

Main Building at Station for Experimental Evolution, with associated buildings. To the left, first section of proposed new animal house, greenhouses, and Blackford Hall (of the Biological Laboratory, Brooklyn Institute of Arts and Sciences). November 1911.

Early in 1904, a lease of a tract of land of about 10 acres, at Cold Spring Harbor, Long Island, New York, was obtained from the Wawepex Society for a term of fifty years. Professor Davenport was appointed Director of the station, the erection of a main laboratory building was begun, and on June 11, 1904, the station

was formally opened. In January 1906, the official designation of Department of Experimental Evolution was adopted.

The Department has the following equipment in buildings:

1. Main laboratory and office building.
2. Director's residence.
3. Stable.
4–7. Greenhouses.
8. General purpose shed.
9. Brooder house.
10. Carpenter shop.
11. Cat house.
12. Shelter for boats.
13. Ice house.
14. Rubble house on Goose Island.

For use in marine collecting a naphtha launch is provided.

Studies have been made in the theory of heredity, using as material sheep, goats, cats, poultry, canaries, and various insects (beetles of several species), flies and crickets, beans, Bursa, Oenothera, sunflowers, maize, poppies, Lychnis, etc. These studies have dealt especially with such topics as dominance, factorial composition of characters, the presence of genotypes in species,

View in garden at Station for Experimental Evolution. Indian corn showing bags used for guarding ears and collecting pollen from the tassel.

the effect of selection, the relation between somatic structure and chromosomes, the combination of various other characters with sex, the influence of soma on germ-plasm. In the field of modification of characters, studies have been made on the effects of varying

the temperature and the light (in cave studies) under which animals develop. Studies of the chemical nature of inheritable characters and on the ontogenesis of positive and negative characters are being carried out. Finally, the study of heredity in man is proceeding with the aid of a corps of field investigators, under the auspices of the Eugenics Record Office, which has been established near by to supply the desirable cooperation.

On April 5, 1909, the Institution purchased for the Department of Experimental Evolution a small island in Long Island Sound, known as Goose Island, for the conduct of investigations on plants and animals in a state of isolation. Upon this Island, through the generosity of Mr. Cleveland H. Dodge, there were built in September 1910 a wharf 70 feet long, and a rubble house of one room, 9 × 14 feet.

A Bed of Oenotheras for Study in Variation.

Besides the tract that is leased the Institution owns a tract of 21 acres, purchased February 1910, lying within a mile of the Station. About 15 acres are wooded and the rest is used as an experimental garden. About 8 acres are leased near the Station for gardens and for the poultry experiments.

GEOPHYSICAL LABORATORY.

Director, Dr. Arthur L. Day.
Address, Geophysical Laboratory, Upton Street, Washington, D. C.

PRESENT INVESTIGATORY STAFF.

L. H. Adams.
Eugene T. Allen.
J. L. Crenshaw.
C. N. Fenner.
John Johnston.
H. E. Merwin.
G. A. Rankin.
E. S. Shepherd.
Robert B. Sosman.
Walter P. White.
Fred. E. Wright.

The Geophysical Laboratory, Upton Street, Washington.

Investigations to determine the modes of formation and the physical properties of the rocks of the earth's crust were begun under the auspices of the Institution in 1904, when grants were made for special researches carried on in Washington at the office of the U. S. Geological Survey, by Dr. G. F. Becker and Dr. Arthur L. Day.

In December 1905, estimates for the erection and equipment of a special laboratory for the experimental work carried on by Dr. Day were formally approved. A site of five acres on an isolated hill, east of Connecticut Avenue and north of Pierce's Mill Road, in the subdivision known as Azadia, District of Columbia,

was purchased, and a contract for construction of the laboratory was let July 6, 1906. Dr. Day was appointed Director of the laboratory and he with his staff took possession of the completed building July 1, 1907.

A Room in the Geophysical Laboratory.

This laboratory has many novel features of construction and equipment. It is especially well provided with apparatus for chemical, physical, and optical work in mineralogy, and with apparatus for the study of materials subject to such high temperatures and high pressures as obtain in the formation of rocks and minerals in the earth's crust.

DEPARTMENT OF HISTORICAL RESEARCH.

Director, Professor J. Franklin Jameson.
Address, Bond Building, Washington, D. C.

PRESENT INVESTIGATORY STAFF.

E. C. Burnett.
Frances G. Davenport.
Elizabeth P. Donnan.
Waldo G. Leland.
D. W. Parker.
L. F. Stock.
Roscoe R. Hill.

In the summer of 1902, a committee of the American Historical Society submitted to the Institution a memorial suggesting methods for the promotion of historical research. This memorial was followed by a report of a special advisory committee on history, and in February 1903 a department of historical research was temporarily organized under the directorship of Professor A. C. McLaughlin. It was originally designated the Bureau of Historical Research. Professor McLaughlin continued his services as Director until October 1, 1905, when he resigned and was succeeded by Professor J. Franklin Jameson. At the same time, also, the present designation of the Department was adopted in place of the original title.

This Department is chiefly occupied with the preparation of publications intended to assist investigators in American history. It issues reports, aids, and guides with respect to historical documents hitherto unclassified and relatively inaccessible. In addition to the sources of American history available in the United States, the sources in foreign archives are also being explored and catalogued. This work has already been extended to archives in Canada, Cuba, Mexico, Great Britain, France, Germany, Italy, and Spain.

Besides these guides to sources the Department is also preparing volumes of important material for American history, such as the American Proceedings and Debates in Parliament, Letters of Delegates to the Continental Congress respecting its Transactions, etc.

DEPARTMENT OF MARINE BIOLOGY.

Director, DR. ALFRED G. MAYER.
Address, Tortugas, Florida.

In December 1903, provision was made for the establishment of a marine biological laboratory, and Dr. Alfred G. Mayer was appointed Director thereof. Early in 1904, the United States Department of Commerce and Labor and the United States Light-

A Glimpse of Bird Life, Tortugas.

house Board granted to the Institution a lease of a favorable site on Loggerhead Key, Dry Tortugas, Florida, in a region remarkable for its abundance of marine life. In July of that year portable buildings were erected on the west side of the key and preparations were made for the work of investigation. In January 1906, the designation Department of Marine Biology was given to this work.

The Department has the following equipment in buildings and boats:

1–2. Marine laboratory buildings, 53 and 87 feet long, respectively.
3. Aquarium.
4. Kitchen.
5. Dock.
6. Machine shop and ship-ways.
7. 70-foot yacht *Anton Dohrn*.
8. 27-foot launch *Sea Horse*.
9. 25-foot launch *Vellela*.
10. 22-foot launch *Porpoise*.

Owing to the danger from tropical storms the laboratory is usually occupied annually only from April to August. Problems relating to the physiology, reactions, habits, morphology, and

The "Anton Dohrn," July 4, 1911.

development of marine life fall especially within the scope of the laboratory and each year a number of investigators in these fields are invited to pursue their researches at Tortugas.

Early in 1905 the laboratory was opened and since then 36 investigators have carried on research there; but as many of these have returned in successive seasons, it may be said that the laboratory has had 64 visiting investigators. Seventy-four original papers based upon work at Tortugas have been published, several of which are volumes of considerable length, and a number of noteworthy discoveries in marine zoology have been recorded.

The Path to the Sea, Tortugas, July 1911.

In June 1911, the new and powerful cruising yacht *Anton Dohrn*, named in honor of the memory and in recognition of the service to science of Anton Dohrn, the founder of the Naples Zoological Laboratory, was put in commission. She is 70 feet long, has two independent engines of 50 horse-power each, and a special dredging engine. Her average speed is 10 knots.

The New Laboratory Building at Tortugas, in Course of Construction, July 30, 1910.

The great hurricane of October 17, 1910, destroyed certain of the laboratory buildings at Tortugas, but these have been replaced upon an enlarged plan and in improved form.

DEPARTMENT OF MERIDIAN ASTROMETRY.

Director, PROFESSOR LEWIS BOSS.
Address, Dudley Observatory, Albany, N. Y.

PRESENT INVESTIGATORY STAFF.

BEULAH L. BENWAY.
BENJAMIN BOSS.
GRACE I. BUFFUM.
LIVIA C. CLARK.
MABEL A. DYER.
LILLIAN V. FOWLER.
SHERWOOD B. GRANT.
HEROY JENKINS.
MARY C. JENNINGS.
FANNIE L. MACNEILL.
HARRY RAYMOND.
ARTHUR J. ROY.
WILLIAM B. VARNUM.
MEADE L. ZIMMER.

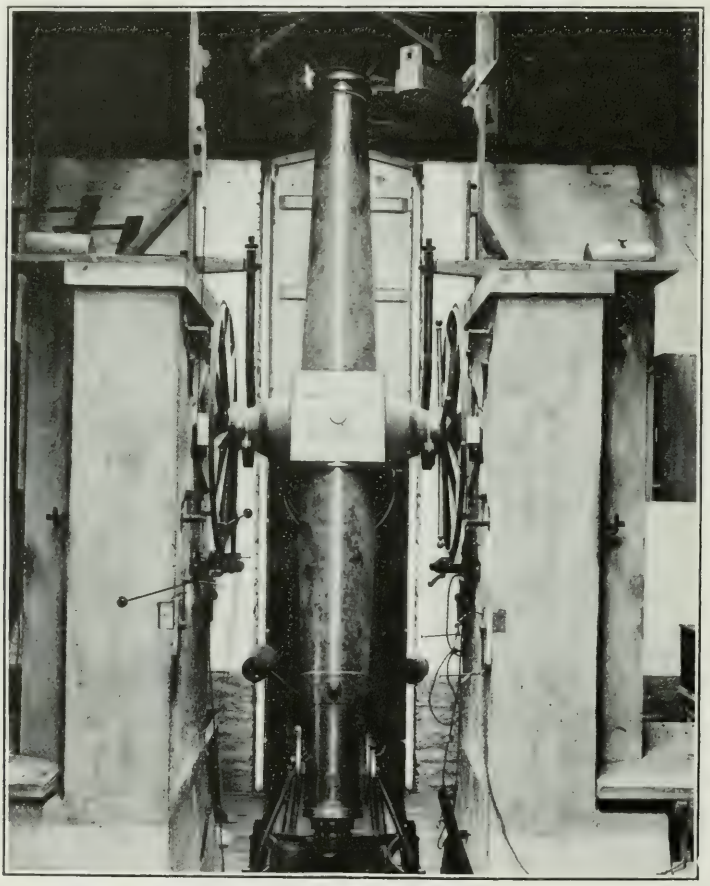
A special advisory committee on astronomy, of which Professor Lewis Boss, Director of the Dudley Observatory, was chairman, recommended, in a report published in the Year Book of the Institution for 1903, the establishment of a temporary meridian observatory in the southern hemisphere. The ultimate object in view in making this recommendation was to secure accurate measures of the positions of the fixed stars visible in the southern hemisphere and to use these, in connection with corresponding measures made at observatories in the northern hemisphere, to produce finally a complete catalogue of precision of all stars from the brightest down to those of the seventh magnitude inclusive for the entire celestial sphere.

Preliminary to this undertaking special grants were made to Professor Boss during the year 1904–05; and in December 1905 the establishment of an observatory in the southern hemisphere was approved and the execution of the project placed in charge of Professor Boss. In March 1907 this branch of work was designated the Department of Meridian Astrometry, and Dr. Boss was formally appointed Director.

Through the courtesy of the government of Argentina, the Southern Observatory was located on national land belonging to the Escuela Regional in San Luis, in latitude south 33° $18'$ and in longitude west 4^{h} 25^{m} 25^{s}, on the East Andean plateau, and at an altitude of about 2,500 feet.

The buildings for the observatory and the quarters for the resident staff were erected during the winter of 1908–09. The instrumental equipment was supplied from the Dudley Observatory, Albany, New York, and the work of observing was begun

in April 1909. This work, with the exception of photometric determinations of the magnitudes of the stars observed, was completed in January 1911. The computations of the positions of the stars are now under way at the Dudley Observatory, Albany, New York. A "Preliminary General Catalogue of 6188 Stars for the Epoch 1900" was published by the Institution for the Department in March 1910. The transit-circle shown below has been long used at Dudley Observatory and was used also at the temporary observatory in Argentina.



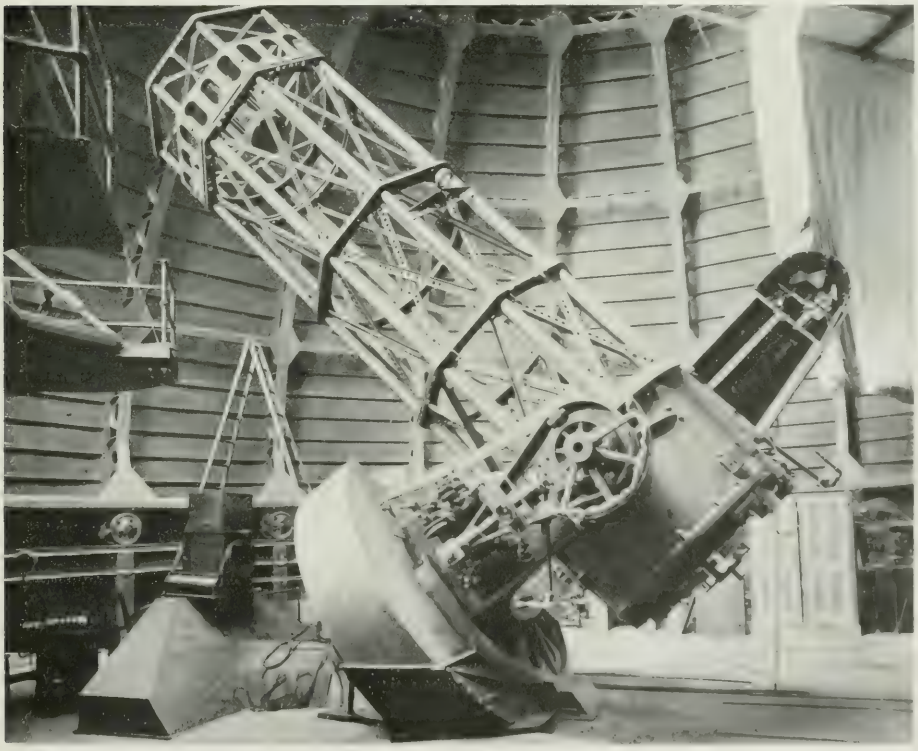
Transit-circle.

MOUNT WILSON SOLAR OBSERVATORY.

Director, PROFESSOR GEORGE E. HALE.
Address, Solar Observatory, Pasadena, California.

PRESENT INVESTIGATORY STAFF.

WALTER S. ADAMS.
HAROLD D. BABCOCK.
CORA G. BURWELL.
FERDINAND ELLERMAN.
INEZ A. ENSIGN.
EDWARD A. FATH.
ARTHUR S. KING.
ARNOLD KOHLSCHÜTTER.
JENNIE B. LASBY.
FRANCIS G. PEASE
MARTHA RENNER.
F. H. SEARES.
M. WANDA SHELDON.
RUTH E. SMITH.
CHARLES E. ST. JOHN.
LOUISE WARE.



Sixty-inch Reflector with Cassegrain Spectrograph attached.

The Solar Observatory has been developed from suggestions and recommendations made in a report from an advisory committee published in 1902 in the first Year Book of the Institution.

The late Professor S. P. Langley, a member of this committee, urged especially the desirability of establishing such an observ-

atory in some elevated subtropical locality. Professor George E. Hale, also a member of the committee, called attention likewise to the importance of additional direct studies of the sun and to

150-foot Tower Telescope.

their bearings on the more general problems of stellar evolution. He recommended particularly the construction of special telescopic devices and the combination of an observatory with a physical laboratory.

After testing the atmospheric and other conditions of various possible sites it was determined in December 1904 to establish an observatory on Mount Wilson, near Pasadena, California; and Professor Hale was appointed director of the enterprise.

The establishment consists of two separate but closely related parts, namely, the observatory with its telescopic equipments and physical laboratory on Mount Wilson; and the office, shops, and physical laboratory in Pasadena. The office and the observatory, although about twelve miles apart, are in intimate connection by means of the telephone.

The observatory proper is equipped with the Snow horizontal reflecting telescope, purchased from the Yerkes Observatory; a

Quarters at Mount Wilson.

tower (vertical) telescope 60 feet high; a tower telescope 150 feet high; and a reflecting telescope 60 inches in diameter, mounted equatorially. The optical and other refined parts of the last three instruments were made at the shops of the observatory in Pasadena. These telescopes are supplied with various spectrographic, photographic, and other devices for studying the sun and similar stellar bodies.

In 1906, Mr. John D. Hooker, of Los Angeles, California, generously offered to provide funds for the construction of a mirror 100 inches in diameter for an additional telescope of the reflecting type; and work on this enterprise is now progressing favorably at the observatory shops.

Mount Wilson, the site of the observatory, is one of the summits of the San Gabriel range, 5,886 feet above sea level, in north latitude 34° 13′ 26″ and in west longitude 118° 3′ 40″. This site and the privileges of use and improvement of the road leading to the mountain have been leased from the Mount Wilson Toll Road Company of Pasadena for a term of 99 years.

The Solar Observatory has the following equipment in buildings:

At Pasadena, California.

1. Office and instrument shop.
2. Erecting house for 60-inch reflector.
3. Hooker building.
4. Physical laboratory.

On Mount Wilson.

5. Steel building for 60-inch reflector.
6. Snow telescope house.
7. 60-foot tower telescope.
8. Physical laboratory.
9. Variometer house.
10. Power house.
11. Pump house.
12. Storage-battery house.
13. "Monastery."
14. Hooker cottage.
15. Engineer's cottage.
16, 17, 18. Small frame houses for night observers.
19. Night assistant's cottage.
20. Frame house for janitor.
21. House for workmen.
22. Storage house for provisions.
23. Store house at foot of new trail.
24. Water reservoir.
25. Fire-pump house.
26. Astrophysical Museum.
27. 150-foot tower telescope.

NUTRITION LABORATORY.

Director, PROFESSOR FRANCIS G. BENEDICT.
Address, Nutrition Laboratory, The Fenway, Boston, Mass.

PRESENT INVESTIGATORY STAFF.

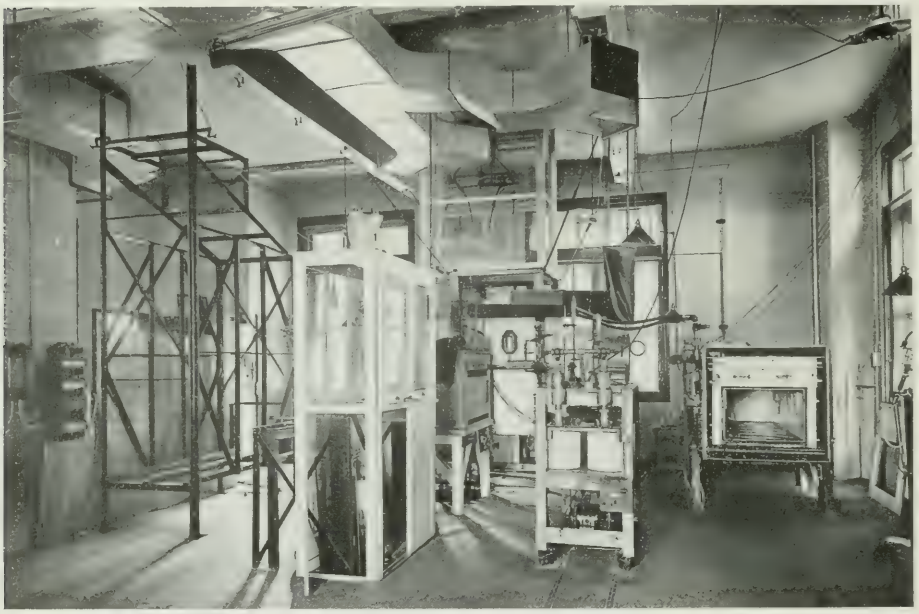
KURT H. ARNDT. J. J. CURRIE. HAROLD L. HIGGINS. PAUL F. JONES.
ELIZABETH B. BABCOCK. L. E. EMMES. CLAUDE H. HOLWAY. F. E. KALLEN.
THORNE M. CARPENTER. J. E. FITZGERALD. ALICE JOHNSON. A. W. PETERS.
ELLIOTT W. HAYES.

The Nutrition Laboratory, Boston.

The investigations in nutrition to which this laboratory is devoted originated with the late Professor W. O. Atwater, of Wesleyan University. During the years 1903 to 1907 grants were made to him and to Professor Francis G. Benedict to aid in constructing a respiration calorimeter and to carry on experiments with this apparatus. The construction of a laboratory especially designed for this purpose was authorized in December 1906, and early in 1907 Professor Benedict was appointed Director. After examination of a number of sites, a plot of ground in Boston, near the Harvard Medical School and a number of large hospitals, was purchased

from the corporation of Harvard College. The construction of the laboratory was begun in July 1907, and it was completed in February 1908. Through the courtesy of the authorities of Harvard College, arrangements were made to secure heat, light, power, compressed air, and refrigeration from the near-by power plant of the Harvard Medical School.

The equipment comprises respiration calorimeters, respirometers, apparatus for control and record of temperatures, apparatus for chemical analysis, a machine shop, and appliances needed in the study of metabolism in both normal and pathological subjects.



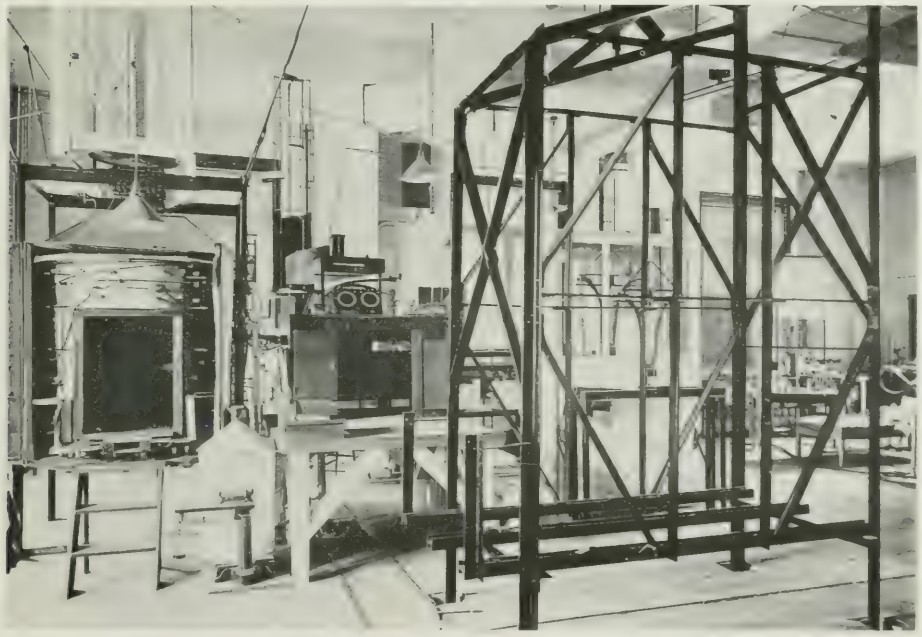
Interior of Calorimeter Laboratory, showing two Calorimeters and Framework of a third.

A suite of rooms is also provided for metabolism experiments on animals, as well as laboratories for investigations by research associates.

Much of the equipment has been developed and constructed in the three years since the completion of the laboratory, including three respiration calorimeters and accessory apparatus for use with man, two respiration chambers for animals and one for infants, three sets of apparatus for studying the respiratory exchange of man, an adiabatic bomb calorimeter, and many other pieces of minor apparatus for use in the different laboratories.

Studies have been made of the metabolism of normal individuals, particularly women, for the purpose of establishing standards,

and an extended study of the metabolism of diabetics has for some time been in progress. Other special lines of research have included studies of the influence on metabolism of the ingestion of food and of pregnancy. Experiments have also been made with dogs to determine the influence on the metabolism of the removal of the hypophysis, and of the effect of feeding meat to dogs without a pancreas. A comparison has been made of direct and indirect calorimetry, the various methods for studying respiratory exchange have been compared, and a topographical study of body temperature has been carried out. Attention has likewise



View of Calorimeter Laboratory. Structural Steel Framework of Calorimeter. Chair Calorimeter with observer's table, galvanometer, and heat-measuring instrument at left, minor respiration apparatus at right.

been given to an investigation of the influence on respiratory exchange of the preceding diet, and of the inhalation of pure oxygen. Aside from the regular chemical work connected with the other investigations, various special lines of research have been conducted, including studies on the composition of outdoor air, of the nutritive value of different servings of food, and on the exact determination of sugar in diabetic urine. The heats of combustion of a number of organic compounds have been determined, and analyses have been made of different diabetic foods. A number of scientists, both American and European, have cooperated in the investigations of the laboratory.

DEPARTMENT OF TERRESTRIAL MAGNETISM.

Director, Dr. L. A. Bauer.
Address, 405, The Ontario, Washington, D. C.

PRESENT INVESTIGATORY STAFF.

J. P. Ault.
H. M. W. Edmonds.
C. K. Edmunds.
H. W. Fisk.
J. A. Fleming.
H. D. Frary.
H. F. Johnston.
E. Kidson.
W. J. Peters.
W. H. Sligh.
C. C. Stewart.
E. N. Webb.
J. Adolf Widmer.

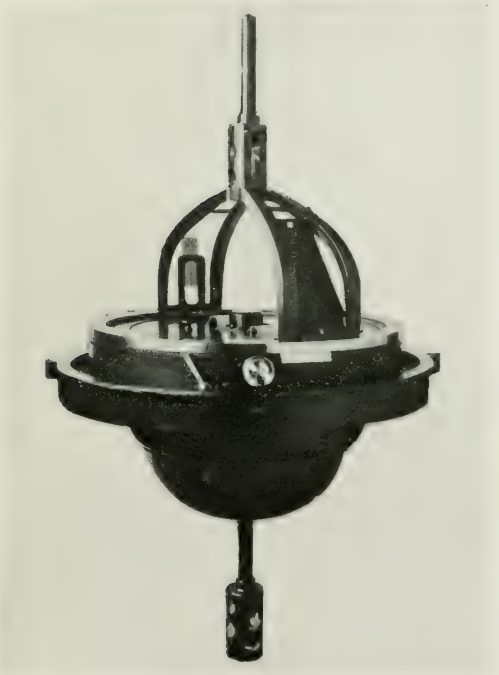
In 1902 Dr. L. A. Bauer submitted to the Institution a plan for a general magnetic survey of the earth. This plan was published in the Year Book for 1902. Work on this survey was begun in a tentative way in April 1904, Dr. Bauer being appointed Director of the Department, which was originally designated as the "Department of International Research in Terrestrial Magnetism."

Observing on board the "Carnegie" in Indian Ocean, July 1911; observers making deflector observations in the after observatory and dip circle observations in the forward observatory.

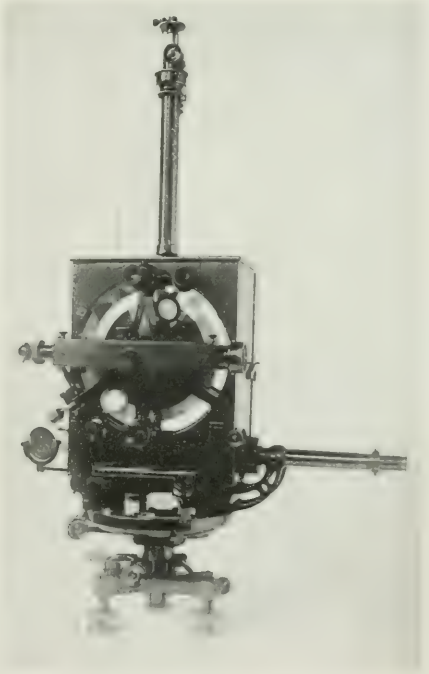
In December 1904, more extensive operations were authorized and preparations were made to fit out a vessel for a survey of the Pacific Ocean. Accordingly, the brigantine *Galilee*, of San Francisco, was chartered for this purpose, and continued in the service from August 1905 until May 1908.

Prior to September 1, 1906, Dr. Bauer had been in charge of the magnetic work of the U. S. Coast and Geodetic Survey and had divided his time, 1904–1906, between work of that organization and work for the Institution. Since that date he has given his undivided attention to the development and extension of the researches of his Department.

The success of the *Galilee* in securing observations of the magnetic elements at sea led to the designing and the construction of the non-magnetic ship *Carnegie*. The contract for this ship was



Deflector designed and constructed by the Department of Terrestrial Magnetism for the Determination of Magnetic Declination and Horizontal Intensity at Sea.



Universal Magnetometer designed and constructed by the Department of Terrestrial Magnetism, replacing former equipment of three distinct instruments.

let December 9, 1908; she was launched June 12, 1909, and set sail August 21, 1909, on her first voyage. Her length over all is 155 feet 6 inches; beam, 33 feet; depth of hold, 12 feet 9 inches; mean draft, 14 feet; displacement, 568 tons. She is primarily a sailing craft, brigantine rigged, but is provided with auxiliary propulsion by means of an internal-combustion engine, for which gas is supplied from a producer. Her novel equipment and freedom from mag-

netism permit making precise magnetic observations at sea almost as readily as on land.

The work already accomplished by the Department may be summarized as follows: Ocean observations embracing the three magnetic elements (declination, dip, and intensity) on cruises in the Atlantic, Pacific and Indian Oceans, aggregating about 105,000 nautical miles; similar observations on land at about 1,500 stations,

The "Carnegie" at Colombo, June 22, 1911, dressed in honor of the Coronation of George V of England.

quite generally distributed over the globe, and located especially in regions where no magnetic results, or but an insufficient number, had been obtained previously. Determinations are made also in the land and ocean work of the secular changes in the magnetic elements, so that it will be possible to refer all the existing values of these elements to the same date.

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